

INTRODUCTION TO DYNAMICS AND NEWTON'S FIRST LAW

Assignment:

Read pages 54-65

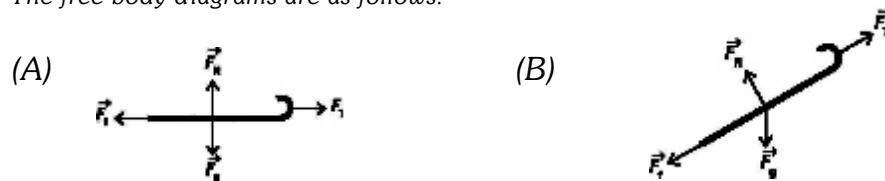
Answer page 55 #4-6; page 56 #7; page 60 #2; page 62 #5; page 63 #6-7

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- #4 The fundamental forces listed in order of decreasing strength are strong nuclear, weak nuclear, electromagnetic and gravitational.
- #5 Among the fundamental forces, gravitational is unique in that only attraction occurs.
- #6 Gravity is the force that tends to be noticed most often, followed by electromagnetic.

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- #7 The free body diagrams are as follows:



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- #2 Regardless of the scenario presented, inertia is dependent on the mass of the object. Thus, the inertia of the school bus > cart > myself > child

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- #5 If the bottom thread is pulled slowly, the top thread will break as one cannot overcome the inertia of the ceiling yet one can overcome the inertia of the hanging mass. If the bottom thread is pulled very quickly, one cannot overcome the inertia of the mass and the bottom thread will break. Try it!

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- #6 Astronauts experience very high accelerations during launch. These accelerations can sometimes be the equivalent of 6 times the force of gravity that you experience on Earth, or $6g$'s. If the astronauts were seated such that their head/spine were aligned parallel to the shuttle, the inertia of their blood would be such that during launch the blood would rush to their feet, depriving them of much needed oxygen. The astronaut would black out. If they are lying horizontally (body perpendicular to the shuttle), then the forces would be spread out throughout their body and there would be little loss of blood from the brain.

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- #7 If the shovel is moving with a heap of snow on top and the motion suddenly stops, the snow's inertia will keep it moving and the snow will slide off the shovel. Imagine shovelling snow up onto a snow bank. The shovel, with the heap of snow on top, in a stationary position could be suddenly jerked backward. The snow's inertia should keep it motionless and the shovel will slide out from beneath the snow.